**Title: Regional Features of Periodic Variability in Mars’s Storm Track and Their Relationship with Large Dust Events**

**Authors (for presentation):**

Karim, Audrey, Zhaoyu, Michael, Lei

**Abstract:**

Similar to Earth’s atmosphere, Mars’s atmosphere exhibits a robust intra-seasonal periodicity of 20–30 days, representing a regular pulsing of extratropical eddy activity, which has important implications for understanding and predicting the weather and climate system. Recent works also demonstrate that such pulses of eddy kinetic energy (EKE) averaged over the midlatitudes have predictive power for regional dust activity on Mars. However, the regional features of such pulses on Mars and the processes involved in causing dust storm activity remain an open question. Conventionally, this periodic behavior is defined by the leading empirical orthogonal function (EOF) pattern of the zonal-mean EKE, referred to as the Baroclinic Annular Mode. However, since the definition relies on the zonal-mean EKE, regional features cannot be independently assessed under this framework.

Using data assimilation datasets for Mars, we analyze the regional features of storm track periodicity using the local finite-amplitude wave activity—a recently introduced diagnostic for Earth’s atmosphere. By comparing the regional features of periodic behavior and dust lifting events, we will show how localized midlatitude eddy activity may play a role in the massive dust storms on Mars, especially on the mechanics involved in the lifting of dust in different regions of Mars. Mars encompasses an asymmetrical topographical setup, where most of the topographical features lay in the southern hemisphere. This begs several questions, but one being: How do the weather patterns, and more importantly, dust storm activity vary in both hemispheres? We will show a strong localization of the periodic behavior in the Martian storm tracks in both hemispheres, and we will also show results comparing different seasons.

Data source:

* The **EMARS-TES** should be in the same place as EMARS-MCS. The TES era is just MY24-MY27. The MCS era starts at MY 28 (a response from Michael about the data).

Some important dates:

* **September 12-13, 2022:** Purdue University EAPS is organizing an inaugural Midwest Climate Workshop. I will give a presentation on this topic.
* **September 19, 2022:** Michael will visit Purdue and give a talk at 10:30 am. Lunch together with the team.
* **NASA proposal dates**:
  + Mars Data Analysis Program ([MDAP](https://pds-ppi.igpp.ucla.edu/roses/2020/MDAP20.jsp)): Step 1 Proposal Due Date 09/25/20; Data Included in PDS by 10/21/20; Step 2 Proposal Due Date 11/20/20.
* **AGU important dates** ([link](https://www.agu.org/Fall-Meeting/Pages/About/Dates-Deadlines)):
  + Abstract already submitted in early August
  + October 4 2022 online program is released
* **Expectations:**
  + **Audrey:** (1). Completing on a preliminary manuscript; (2). Retrieve the Dust storm dataset and reproduce the key figures of our prior communication. All matter is the data itself. At the beginning of Sept. Lei will reach Audrey to do a comparison analysis between wave activity and dust storm. Please focus on the above TES era. Aspiration goal: to transform the excel data to a more generic format, such as python data.
  + **Karim:** (1). Download all **EMARS** to the **Data Depot** folder, please make sure that you can see the TES era. (2). Barebone version of a python code to read the data.
  + Zhaoyu will analyze the LWA data.
  + Group Meeting: 30 min per week. If nothing important to update, we can also skip some weeks, but at the beginning of the semester, let’s still keep regular weekly meetings.